

## LETTERS

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### A CASE OF PREDATION OF A EURASIAN EAGLE-OWL BY A BONELLI'S EAGLE

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Superpredation, defined as an interaction in which a predator kills and eats another predator, has been widely studied previously (Lourenço et al. 2011b, 2014) and is a widespread phenomenon in raptor assemblages (Sergio and Hiraldo 2008). A particular case of superpredation is intraguild predation, in which a species preys on another species of the same guild that could be a potential competitor (Polis et al. 1989). Although sometimes overlooked in dietary analyses, superpredation can be an important mechanism regulating population dynamics that leads to behavioral responses among different members of the community (Lourenço et al. 2014).

It is well known that the Eurasian Eagle-Owl (*Bubo bubo*) is one of the greatest top predators of the Palearctic region (Cramp and Simmons 1980, Ferguson-Lees and Christie 2001). However, the opposite situation, in which eagle-owls are preyed by other raptors, is extremely uncommon (Mikkola 1976, Lourenço et al. 2011b). The Bonelli's Eagle (*Aquila fasciata*) and Eurasian Eagle-Owl (*Bubo bubo*) are long-lived territorial species that coexist in sympatry in southwestern Europe, and are considered top avian predators in human-dominated Mediterranean ecosystems (Cramp and Simmons 1980, Ferguson-Lees and Christie 2001). Although these species show some degree of dietary and niche overlap (e.g., competition for prey and nest sites), eagles and owls reduce competition via temporal niche partitioning (Lourenço et al. 2011b): Bonelli's Eagles concentrate their activities during the daytime, whereas owls are crepuscular. On very rare occasions, Eurasian Eagle-Owls prey upon Bonelli's Eagles, particularly nestlings (Bayle 1987, Real and Mañosa 1990).

According to previous work, three raptor species have been recorded killing Eurasian Eagle-Owls: Golden Eagles (*Aquila chrysaetos*) in Sweden, Finland, and Mongolia

(Mikkola 1976, Ellis et al. 2000); White-tailed Eagle (*Haliaeetus albicilla*) in Sweden (Mikkola 1976); and Steppe Eagle (*Aquila nipalensis*) in Russia (Vazhov et al. 2013). However, there are no published detailed observations of a case of predation of a Eurasian Eagle-Owl by a Bonelli's Eagle. To the best of our knowledge, there is only one reported case of consumption of a Eurasian Eagle-Owl by a Bonelli's Eagle in the literature (Martínez et al. 1994), but no details were given that would allow determination of whether it was a case of predation or simply opportunistic scavenging. Here, we report a case of predation of a Eurasian Eagle-Owl by a Bonelli's Eagle, which we documented during a remote tracking research project conducted in Sierra de Espadán Natural Park, Castellón, Spain (39°52.0'N, 0°17.5'W).

During 2015, we trapped and equipped a territorial pair of Bonelli's Eagles with solar GSM-GPS-ACC loggers (48g; e-obs GmbH, Gruenwald, Germany) using Teflon backpack-style harnesses. We programmed the tags to record GPS locations every 5 min from 1 hr before sunrise until 1 hr after sunset. The pair consisted of an adult male (>4 yr old, mass = 2000 g) that we trapped on 10 June 2015 and a subadult female (2 yr old, mass = 2900 g) trapped on 6 November 2015. We determined these birds were paired based on observations of territorial and pair-bond behavior (e.g., often observed flying together; P. López-López, C. García-Ripollés, J. Giménez, and V. Urios unpubl. data).

The predation event occurred on 28 November 2015, when the subadult female eagle roosted at 1755 H in the middle part of a hillside, very close to a few isolated pine trees (*Pinus halepensis*). She remained in the same place until 1135 H the next day (29 November 2015) and came back at 1710 H in that evening. She remained overnight and did not move until 1315 H the next day (30 November 2015). On 1 December 2015, the female returned again to the same place from 1000–1045 H, and from 1250–1325 H on 2 December 2015.

The male eagle went with the female on 28 November 2015 at 1755 H. He remained close to the female at the predation location until 29 November 2015 at 0750 H.

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Then, he moved to a perch located in the upper part of the hill and his last visit to the predation location took place from 1125–1135 H on 29 November 2015. Afterwards, the male did not revisit the predation location, but made short visits to the vicinity (<250 m) on 29 November 2015 at 1630 H, on 30 November 2015 from 1555–1600 H, on 1 December from 0925–0945 H, and finally, on 2 December 2015 from 1125–1135 H.

Because of the unusual recording by GPS telemetry, we visited the cluster of GPS locations on 1 December 2015 from 1030–1300 H. We found the partially consumed carcass of a Eurasian Eagle-Owl. Importantly, the owl remains were still fresh (i.e., blood was not completely coagulated), ruling out the possibility that eagles were scavenging on the carcass. We took several pictures and collected tissue samples and feathers. According to molecular sexing (Griffiths et al. 1998) and plumage characteristics (Martínez et al. 2002), the eagle-owl was a third-calendar-year male. Interestingly, the event occurred just at dusk (the sun set at 1737 H on 28 November 2015; Spanish National Geographical Institute, <http://www.fomento.gob.es/>), during the period of the year when Eurasian Eagle-Owl vocal activity is highest, associated with territorial and pre-breeding behaviors. Furthermore, there was spatial overlap between the territory of the Bonelli's Eagle pair and an eagle-owl's territory in this area (P. López-López, C. García-Ripollés, J. Giménez, and V. Urios unpubl. data).

Four different hypotheses could account for this unusual superpredation behavior between the Bonelli's Eagle and the eagle-owl: (1) food-stress hypothesis (Serrano 2000, Lourenço et al. 2011b), which postulates that the top predator searches for alternative prey species in situations of food scarcity; (2) the competitor-removal hypothesis (Serrano 2000), which implies that Bonelli's Eagles perceive eagle-owls as potential competitors and deliberately eliminate them; (3) the predator-removal hypothesis (Lourenço et al. 2011a, 2014), by which Bonelli's Eagles would kill eagle-owls to avoid predation by the owls; and, (4) the "opportunistic diet hypothesis" (Polis et al. 1989), which suggests that the Bonelli's Eagle could have preyed upon the eagle-owl by chance as a consequence of an injury or illness of the latter. Although some of these hypotheses are not mutually exclusive, in light of our field observations and experience with both species in the study area, we would favor the first hypothesis as food availability is low in our study area (P. López-López, C. García-Ripollés, J. Giménez, and V. Urios unpubl. data). The second and third hypotheses could also account for this behavior, especially considering previous events of nestling Bonelli's Eagles being killed by eagle-owls (Real and Mañosa 1990). Notwithstanding, if the "predator-removal hypothesis" were true, the frequency of lethal interactions among both species would be probably much higher and thus previously reported in the literature. Unfortunately, we cannot rule out the fourth hypothesis, as the eagle-owl was partially consumed and hence we were unable to determine information about its body condition.

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## TURKEY VULTURE SCAVENGING PREY AT A BROAD-WINGED HAWK NEST

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**KEY WORDS:** *Turkey Vulture*, *Cathartes aura*; *Broad-winged Hawk*, *Buteo platypterus*; *breeding*; *diet*; *hawk*; *scavenging*.

Turkey Vultures (*Cathartes aura*) use a keen sense of smell and eyesight to locate potential prey even within dense forests (Chapman 1938, Stager 1964, Houston 1986). As opportunistic feeders, vultures vary their diets, depending on local and regional availability of large and small mammals and non-mammals, either wild or domestic (Hiraldo et al. 1991). Generally, Turkey Vultures prefer to feed on the ground on relatively fresh carrion (Owre and Northington 1961); they also feed in other unusual ways, such as wading in shallow water to fish and feed on carcasses (Jackson et al. 1978), or sometimes landing on and feeding on floating carcasses (e.g., American alligator [*Alligator mississippiensis*] and manatee [*Trichechus* spp.]; Bendire 1982, Morant and Winter 1984). While conducting behavioral observations on nesting Broad-winged Hawks (*Buteo platypterus*) in Delaware State Forest in eastern Pennsylvania, we observed a Turkey Vulture scavenging on prey remains within the nest of a Broad-winged Hawk.

On 13 July 2015, CLB arrived at 0700 H EDT at one of the Broad-winged Hawk nest study sites in the Delaware State Forest, Pike County, PA (41°15.87'N, 75°01.21'W). Habitat around the nest, which was in a 19.6-m tall white oak tree (*Quercus alba*), was mixed-deciduous forest with a nearby stream and pond. We observed hawk nesting activity with a 20–60× zoom KOWA TSN-821 spotting scope from a blind 60 m from the nest tree. We had observed this nest,

which originally contained two nestlings that hatched 16–18 June 2015, twice weekly since 20 May 2015. On 13 July, only one Broad-winged Hawk nestling was at the nest, the other having disappeared sometime between 10 and 13 July. An adult hawk visited the nest three times during the morning to deliver prey: an eastern chipmunk (*Tamias striatus*) at 0808 H, an unidentified prey item at 0926 H, and a small passerine at 1057 H. The adult fed the unidentified prey to the single young for 11 min, starting at 0926 H, but left the first and third prey items in the nest for the nestling. The nestling fed on these prey items, intermittently, for 35 min after the delivery of the third item.

At 1208 H, CLB saw a Turkey Vulture flying above the canopy. In less than 1 min, it perched on an adjacent tree, about 3 m above the nest, and hissed several times. At 1209 H, the vulture moved from the adjacent tree onto a branch in the nest tree, approximately 1 m above the nest. At 1210 H the Turkey Vulture took a step backward and down toward the nest. It continued to move down the branch, backing into the nest with wings partially extended. At the same time, the nestling walked about 0.5 m onto a branch in the opposite direction out of the nest. The Turkey Vulture started to consume the remains of both the eastern chipmunk and passerine the adult had delivered to the nest. The nestling continued to move away from the vulture along the branch at 1212 H, stopping approximately 3–5 m from the nest. The Turkey Vulture continued to consume prey remains in the nest for the next 11 min.

At 1223 H, an adult Broad-winged Hawk silently approached the nest tree from the east and flew at the Turkey Vulture. The Turkey Vulture took flight immedi-

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